Investigation of the food value chain of ready-to-eat chicken and the associated risk for staphylococcal food poisoning in Tshwane Metropolitan, South Africa

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Introduction

- The great majority of poor people in developing countries obtain food from informal or “wet markets”
  - They are often neglected by food safety authorities
  - Little is known about their impacts on public health
- Studies in SA indicate a need for improving safety of street vended foods (von Holy & Makhoane, 2006)

‘walkie-talkies’ sold in township, photo Alamy

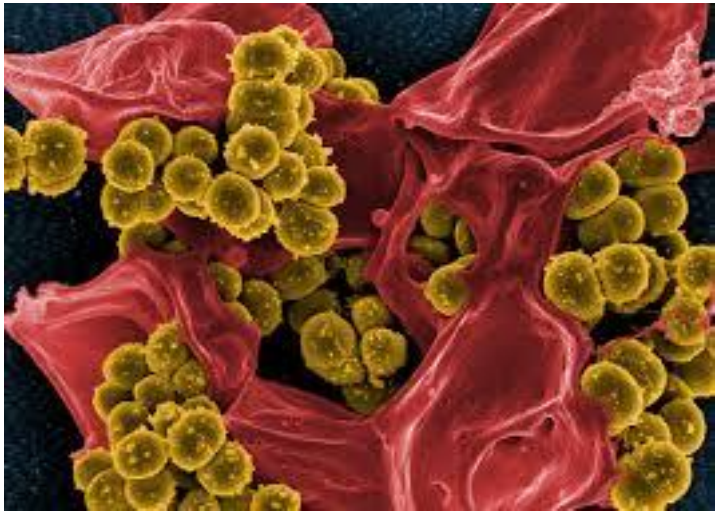
Introduction

- Studies indicate the importance & the benefits associated with the informal sector (Steyn et al., 2012)
  - Income generation for producers, processors and sellers
  - Nutrition for consumers by providing low cost, accessible food

- Studies also find high levels of hazards (Grace et al., 2012)
  - Very few studies look at risk to human health
  - Hazards may be high, but health risks low and vice versa
  - Management of hazards should not compromise nutrition & income benefits

Introduction

- Staphylococcal food poisoning
  - poses health risks to consumers & economic burdens on individual communities & nations
  - is one of the most common food-borne diseases that affects hundreds of thousands of people each year worldwide
  - CDC: 240,000 illnesses, 1,000 hospitalizations & 6 deaths associated with SFP occur annually in USA



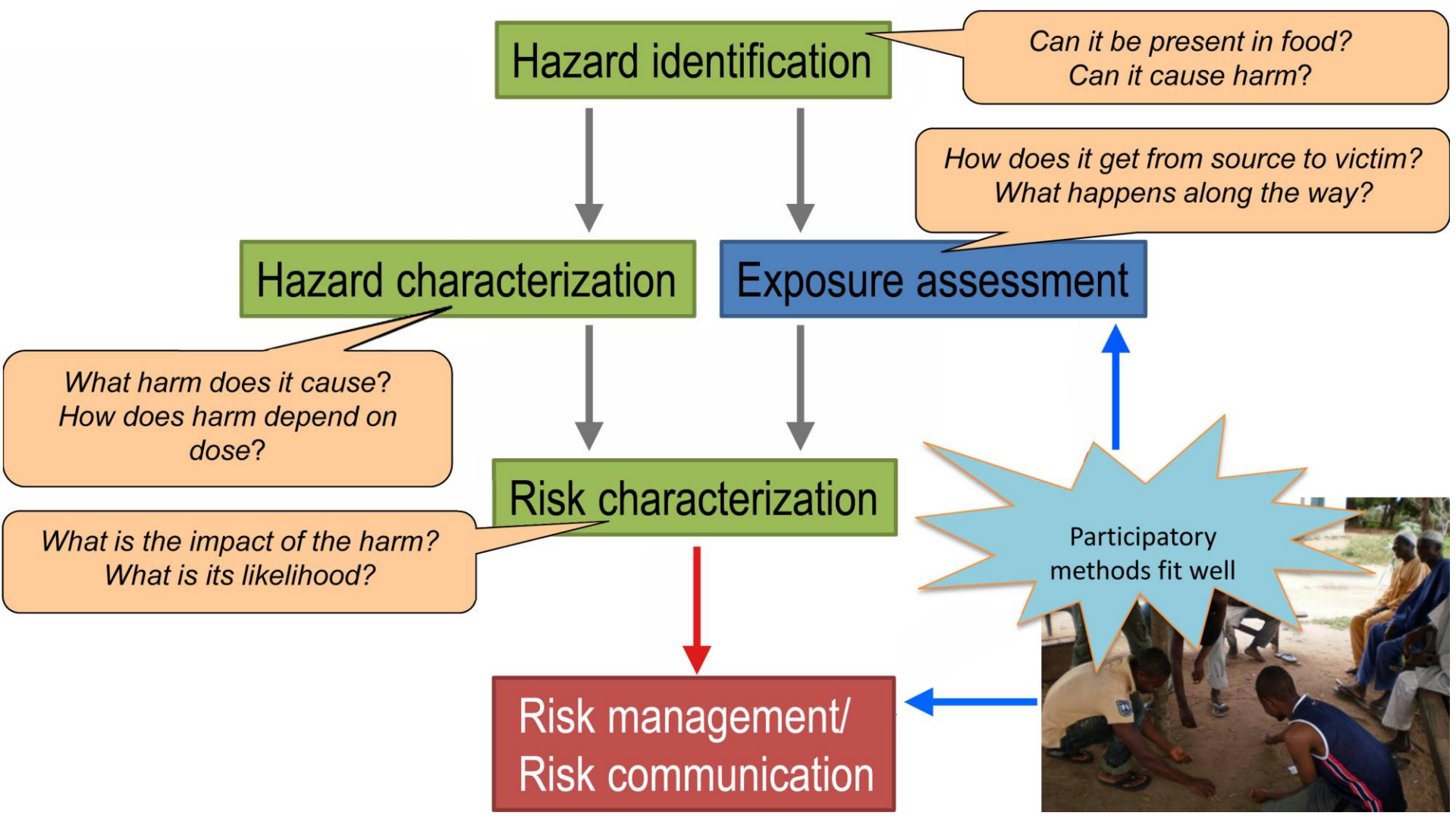
S. aureus, photo Microbeworld

OBJECTIVE OF THE STUDY

- To better understand the informal markets for ready-to-eat (RTE) chicken in in Tshwane Metropolitan Municipality, South Africa
  - Assessing the links between the formal and informal sectors.
- Assess the risk of staphylococcal food poisoning (SFP) through consumption of RTE chicken sold by informal vendors.

Methodology

- Participatory risk assessment
  - Following the procedure of the Codex Alimentarius Commission system framework
  - Participatory methods are well suited where there is a need to improve understanding of issues and yet data is scarce
  - Participatory methods include:
    - interviews and focus group discussions, visualizations, and proportional piling (Catley and Berhanu, 2003)


Hazard identification
Can it be present in food?
Can it cause harm?
How does it get from source to victim?
What happens along the way?
Hazard characterization
Exposure assessment
What harm does it cause?
How does harm depend on dose?
Risk characterization
What is the impact of the harm?
What is its likelihood?
Participatory methods fit well
Risk management/
Risk communication

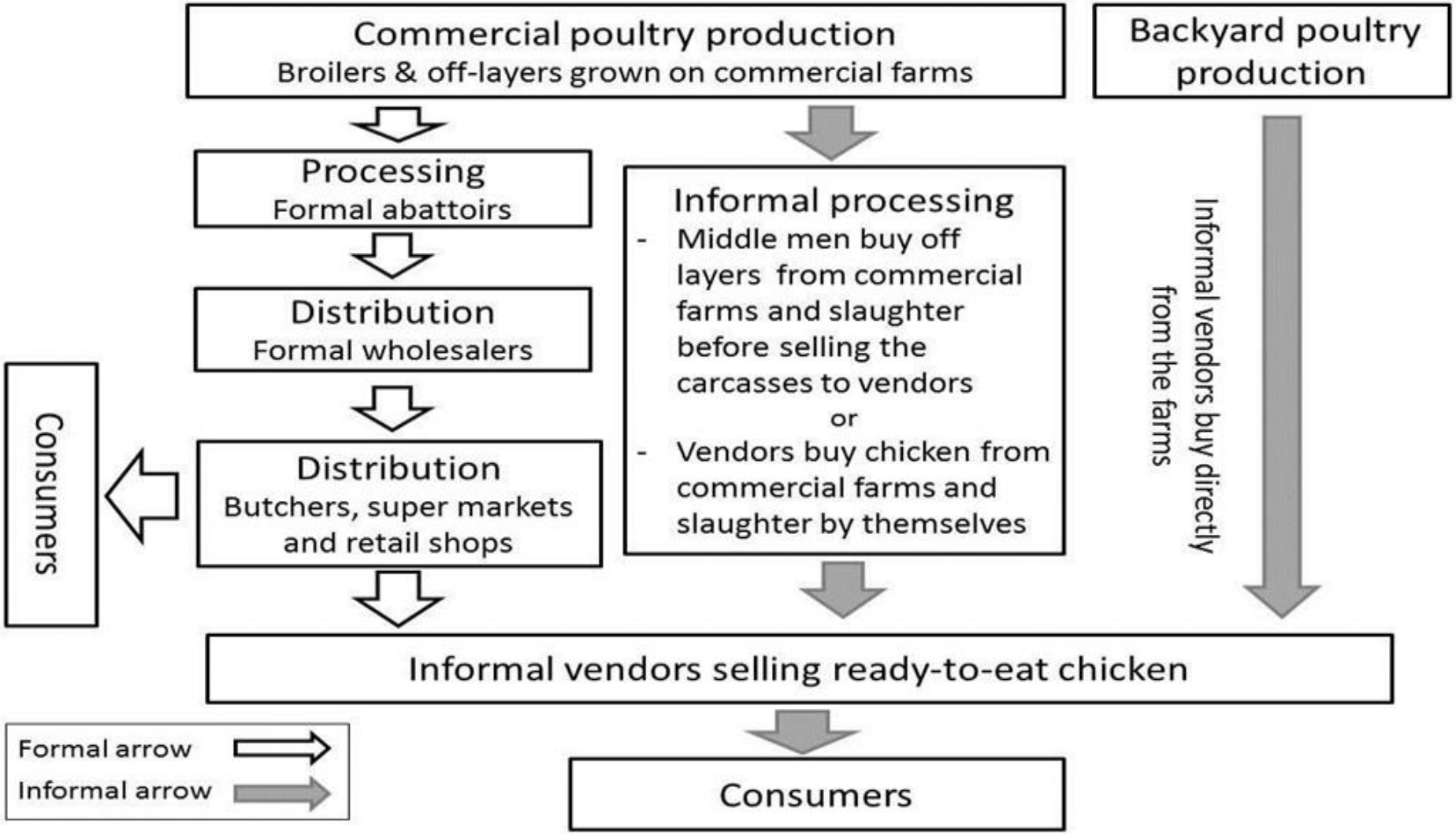
Data collection

- Structured interviews and focus group discussions with informal vendors (n= 237)
  - understand poultry value chains for informal RTE chicken, operation of business and hygiene practices
- *Staphylococcus aureus* counts were determined using 3M™ Petrifilm™ plates
  - Samples (n=100) of RTE chicken collected from informal vendors in six major taxi ranks.
- Available published data-literature review

Results and Discussion

- Mapping of the food value chain:
  - 3 possible value chains
    - one formal chain,
    - two formal-informal hybrid chains
    - one purely informal chain

- Mapping shows:
- Possibility of establishing traceability of RTE chicken sold on the informal markets in Tshwane.
- Cross-over between formal and informal sectors.
- Value chains are short: few steps & a relatively short time between producer & consumer.


Commercial poultry production
Broilers & off-layers grown on commercial farms
Backyard poultry production
Processing
Formal abattoirs
Distribution
Formal wholesalers
Distribution
Butchers, super markets and retail shops
Consumers
Informal processing
- Middle men buy off layers from commercial farms and slaughter before selling the carcasses to vendors
or
- Vendors buy chicken from commercial farms and slaughter by themselves
Informal vendors buy directly from the farms
Informal vendors selling ready-to-eat chicken
Consumers
Formal arrow
Informal arrow

Results and Discussion

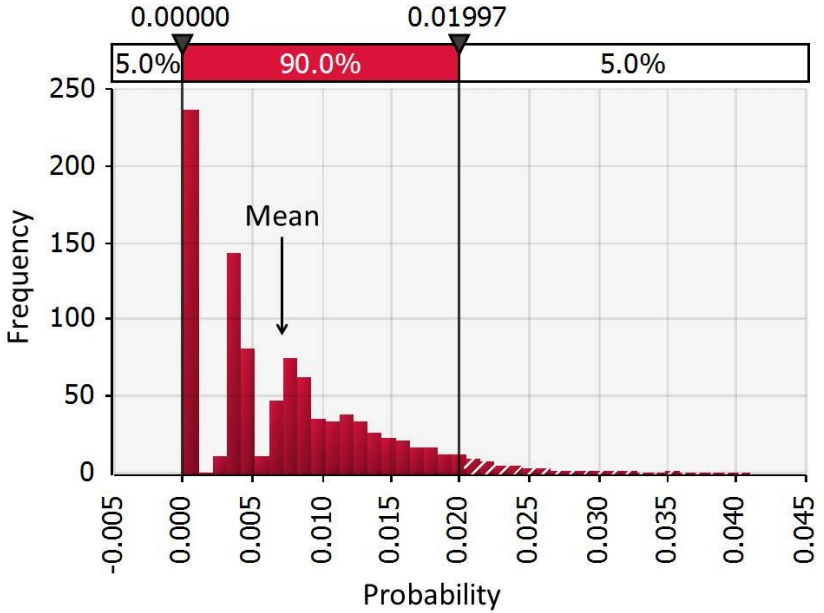
- Contamination of RTE chicken
  - High prevalence of *S. aureus* (44%) &
  - high prevalence of RTE chicken of unsatisfactory quality (>10^3cfu/g)
- Previous studies reported that bacterial concentration on informally-sold RTE chicken ranged from 10^2 - 10^3 cfu/g
- Food with reduced numbers of competitors is suitable for *S. aureus*

Results and Discussion

- The mean *S. aureus* counts in the ready to eat chicken
  - $10^{3.6}$ (90%CI: $10^{3.3}$ – $10^{3.9}$),
- The risk of purchasing chicken of unsatisfactory quality (>10^3cfu/g)
  - 32.9% (90%CI: 25.5%-40.4%).

Results and Discussion

- The risk of illness
  - low (1.3% (90% CI: 0%-2.7%).
  - bacteria concentration of *S. aureus* on the chicken rarely exceeds 10^5cfu/g (threshold for *S. aureus* required to produce sufficient toxins to cause SFP)
  - low mean cfu/g of *S. aureus* on RTE chicken observed in the present study.



Results and Discussion

- Sensitivity analysis
  - probability of *S. aureus* having the enterotoxin gene was the most sensitive parameter for SFP.
  - followed by *S. aureus* concentration in RTE chicken and
  - lastly the prevalence of *S. aureus* in ready-to-eat chicken
- NOTE: present study does not take into account the proportion of SEs with emetic property & the proportion of susceptible population, it may be over-estimating the risk

Conclusion

- A strong link between formal and the informal market
- So traceability, which is important for food safety of informally traded RTE chicken, is possible
- Due to low risk observed, sale of RTE chicken by informal vendors can be encouraged
- Hygiene training to reduce the concentration levels of *S. aureus* on the RTE chicken is recommended
  - promote the sale of safer affordable source of protein for the large urban poor population in South Africa.

Thank you

Questions and Comments?

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